

STATEMENT OF LEGAL AND FACTUAL BASIS

East Tennessee Natural Gas, LLC
McClure, Dickenson County, Virginia
Permit No. SWRO11046

Title V of the 1990 Clean Air Act Amendments required each state to develop a permit program to ensure that certain facilities have federal Air Pollution Operating Permits, called Title V Operating Permits. As required by 40 CFR Part 70 and 9 VAC 5 Chapter 80, East Tennessee Natural Gas, LLC has applied for renewal of the Title V Operating Permit for its Compressor Station 3401 facility located at McClure, Virginia. The Department has reviewed the application and has prepared a Title V Operating Permit.

Engineer/Permit Contact: _____

Date: August 28, 2006

Air Permit Manager: _____

Date: August 28, 2006

Deputy Regional Director: _____

Date: August 28, 2006

FACILITY INFORMATION

Permittee

East Tennessee Natural Gas, LLC
P.O. Box 1642
Houston, Texas 77251-1642

Facility

Compressor Station 3401
State Route 654
McClure, Virginia 24269

County-Plant Identification Number: 51-051-00034

SOURCE DESCRIPTION

NAICS Code: 486210 – Booster pumping station, natural gas transportation

Natural gas enters the facility from local production facilities to a set of scrubbers where impurities are separated from the natural gas. The natural gas then goes through the multi-stage gas compressors. From there, the natural gas goes through the dehydration unit and then into the transmission pipeline for distribution to customers along the pipeline system. Two natural gas-fired Cooper-Bessemer, model 8W-330, clean burn, 2 cycle, reciprocating engines (emission unit I.D. S001 and S002) rated at 4,650 hp (34.9 MMBtu/hr) each, are used for natural gas compression. Other equipment at the facility includes: one Taylor Forge triethylene glycol dehydration unit with a 0.95 MMBtu/hr reboiler (S003); one Peerless model 211A8 natural gas-fired boiler (S005) rated at 1.47 MMBtu/hr; and one Cummings model GTA-1710 generator with a natural gas-fired engine (S006) rated at 710 hp. The previously permitted John Zink flare, S004, is to be removed.

The facility is a Title V major source of nitrogen oxides (NO_x), carbon monoxide (CO) and formaldehyde, which is a hazardous air pollutant (HAP). This source is located in an attainment area for all pollutants, and is a Prevention of Significant Deterioration minor source. The facility is currently permitted under a minor new source review (NSR) permit issued on January 23, 2001 (as amended March 28 and May 3, 2006), and a Title V operating permit with an expiration date of September 7, 2006.

COMPLIANCE STATUS

A full compliance evaluation of the facility, including a site visit, was conducted on August 30, 2004, and partial compliance evaluations with site visits were conducted on November 18, and November 28, 2005. In addition, all reports and other data required by permit conditions or

regulations, which are submitted to DEQ, are evaluated for compliance. Based on these compliance evaluations, the facility has not been found to be in violation of any state or federal applicable requirements at this time.

EMISSION UNIT AND CONTROL DEVICE IDENTIFICATION

The emissions units at this facility consist of the following:

Emission Unit ID	Stack ID	Emission Unit Description	Size/Rated Capacity	Pollution Control Device Description (PCD)	PCD ID	Pollutant Controlled	Applicable Permit Date
Fuel Burning Equipment							
S001	S0011	Reciprocating compressor engine, Cooper-Bessemer, model 8W-330, natural gas-fired	4,650 horsepower	Air/Fuel ratio controller	Not Applicable	NOx, CO and total hydrocarbons	1/23/01 (as amended 3/28/06 and 5/3/06)
S002	S0021	Reciprocating compressor engine, Cooper-Bessemer, model 8W-330, natural gas-fired	4,650 horsepower	Air/Fuel ratio controller	Not Applicable	NOx, CO and total hydrocarbons	1/23/01 (as amended 3/28/06 and 5/3/06)
S003	S003	Taylor Forge glycol regeneration boiler, natural gas-fired	950,000 Btu/hr	None	Not Applicable	None	1/23/01 (as amended 3/28/06 and 5/3/06)
S005	S005	Boiler, Peerless, model 211A8, natural gas-fired	1.47 million Btu/hr	None	Not Applicable	None	1/23/01 (as amended 3/28/06 and 5/3/06)

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Emission Unit ID	Stack ID	Emission Unit Description	Size/Rated Capacity	Pollution Control Device Description (PCD)	PCD ID	Pollutant Controlled	Applicable Permit Date
Fuel Burning Equipment							
S006	S006	Generator engine, Cummings, model GTA-1710, natural gas-fired, used for emergency electrical power	710 horsepower	None	Not Applicable	None	1/23/01 (as amended 3/28/06 and 5/3/06)
Glycol Dehydration Unit							
S003	S003	Taylor Forge dehydration unit	60 million standard cubic feet of gas per day, input	Air cooled condenser to be replaced by a Tornado Technologies, Inc. TTI-DSCVI natural gas-fired thermal oxidizer rated at 1.736 mmBtu/hr	S003-C (to be replaced by S003-TO)	Volatile organic compounds (VOC), benzene, toluene, ethyl benzene and xylenes	1/23/01 (as amended 3/28/06 and 5/3/06)

EMISSIONS INVENTORY

A copy of the 2004 annual emission update is attached. Emissions are summarized in the following tables.

2004 Actual Emissions

	2004 Criteria Pollutant Emission in Tons/Year				
Emission Unit	VOC	CO	SO ₂	PM-10	NO _x
S001	13.0	28.17	0.063	1.74	46.59
S002	12.87	27.88	0.062	1.73	46.11
S003	0.017	0.25	0.002	0.01	0.30
S004	0.02	-----	-----	-----	-----
Total	25.91	56.30	0.127	3.48	93.0

The John Zink flare, S004, is no longer a permitted unit and is to be removed as indicated in the minor NSR permit dated January 23, 2001 (as amended March 28 and May 3, 2006).

2004 Facility Hazardous Air Pollutant Emissions

Pollutant	2004 Hazardous Air Pollutant Emission in Tons/Year
Formaldehyde	14.17

EMISSION UNIT APPLICABLE REQUIREMENTS - Fuel Burning Equipment, S001, S002, S003, S005, and S006

Limitations

The following limitations are State BACT requirements from Conditions 3, 6, 7, 8, and 9 of the minor NSR Permit issued on January 23, 2001 (as amended March 28 and May 3, 2006):

Condition 3 requires control of NO_x, CO and total hydrocarbon (THC) emissions from each Cooper-Bessemer compressor engine (S001 and S002) by ignition retard, air manifold temperature reduction and by maintaining an optimum air-to-fuel ratio.

Condition 6 limits the approved fuel for each Cooper-Bessemer compressor engine (S001 and S002), reboiler (S003), Peerless boiler (S005), and auxiliary generator (S006) to natural gas.

Condition 7 limits the consumption of natural gas by each Cooper-Bessemer compressor engine (S001 and S002) to no more than 34,324 cubic feet per hour and 300,680,000 cubic feet per year.

Condition 8 limits emissions from the operation of each Cooper-Bessemer compressor engine (S001 and S002) to the following:

Particulate Matter (PM)/PM-10	1.7 lb/hr	7.4 tons/yr
Nitrogen Oxides (as NO ₂)	14.8 lb/hr	64.8 tons/yr
Carbon Monoxide	13.4 lb/hr	58.7 tons/yr
Volatile Organic Compounds	4.2 lb/hr	18.4 tons/yr

Annual emissions shall be calculated as the sum of each consecutive 12-month period.

Condition 9 limits visible emissions from each Copper-Bessemer compressor engine exhaust stack (S0011 and S0021) to 5% opacity as determined by EPA Method 9 (reference 40 CFR 60, Appendix A).

The following Virginia Administrative Codes that have specific emission requirements have been determined to be applicable:

9 VAC 5-50, Article 1, Standards of Performance For Visible Emissions and Fugitive Dust/Emissions for Visible Emissions

According to 9 VAC 5-50-60 A.1, the provisions of Article 1 apply to each source of visible emissions. 9 VAC 5-50-80 of Article 1 limits discharge into the atmosphere from any affected facility any visible emissions, which exhibit greater than 20% opacity, except for one six-minute period in any one hour of not more than 30% opacity.

This opacity limit will be included in the permit for the reboiler (S003), Peerless boiler (S005) and generator engine (S006) exhaust stack.

Monitoring

The monitoring and recordkeeping requirements in Condition 10 of the NSR permit have been modified to meet Part 70 requirements.

The emission control requirements for the Cooper-Bessemer compressor engines will be monitored on a daily basis by recording air manifold pressure and fuel gas pressure for each engine.

Combustion units firing natural gas and being properly maintained are not expected to violate an SO₂, PM or opacity emission standard. The permit requires fuel burning equipment (S001, S002, S003, S005, and S006) to burn only natural gas; training of employees in the proper operation of equipment; and, development of a maintenance schedule. The fuel requirement will be monitored

by recording monthly and annual consumption of natural gas.

Hourly emission limits established for PM/PM-10, NO_x, CO and VOC from each Cooper-Bessemer compressor engine (S001 and S002) are based on the maximum capacity of the Cooper-Bessemer compressor engines. Therefore, if the Cooper-Bessemer compressor engines are operated at capacity, or below, there should not be a violation of the hourly emission limits. Calculations have been included in Attachment A to demonstrate how the limits were obtained.

Annual emission limits established for PM/PM-10, NO_x, CO and VOC from each Cooper-Bessemer compressor engine (S001 and S002) are based on natural gas consumption limits contained in Condition 7 of the NSR permit. Regarding these pollutants, natural gas consumption is the factor that determines emission rates. Calculations have been included in Attachment B to demonstrate that if the Cooper-Bessemer compressor engines (S001 and S002) consume all that is permitted or less, then the emission limits should not be violated. Recordkeeping demonstrating compliance with the natural gas consumption limits can be used to demonstrate compliance with the permitted emission limits; therefore, natural gas consumption limits satisfy the periodic monitoring requirement.

A review of 40 CFR Part 64, Compliance Assurance Monitoring (CAM) indicates those requirements do not apply to any of the fuel burning equipment, S001, S002, S003, S005, and S006. Condition 3 of the NSR permit requires control of NO_x, CO and THC emissions from each Cooper-Bessemer compressor engine (S001 and S002) by ignition retard, air manifold temperature reduction and maintaining an optimum air-to-fuel ratio, each of which prevents pollutants from forming. 40 CFR 64.1 indicates those type measures are considered passive controls and not control devices for the purposes of CAM. Therefore, the engines do not meet the applicability criteria in 40 CFR 64.2 (a)(2). No control devices are associated with the other fuel burning equipment, S003, S005, and S006, and potential emissions from those units are below Title V major source levels. Therefore, S003, S005, and S006 do not meet the applicability criteria in 40 CFR 64.2 (a)(2) or (a)(3).

Recordkeeping

The permit includes requirements for maintaining records of all monitoring and testing required by the permit. The permittee will be required to keep records of the following:

Daily air manifold pressure and fuel gas pressure for each compressor engine;

Monthly and annual consumption of natural gas for each compressor engine; and

Emission factors and equations used to calculate emissions.

Testing

The permit does not require source tests. A table of test methods has been included in the permit if testing is performed. The Department and EPA have the authority to require testing not

included in this permit if necessary to determine compliance with an emission limit or standard.

Reporting

There are no specific reporting requirements applicable to the fuel burning equipment, S001, S002, S003, S005, and S006.

EMISSION UNIT APPLICABLE REQUIREMENTS - Glycol Dehydration Unit, S003

Limitations

As an existing natural gas transmission facility with potential emissions of HAP at major source levels and containing a glycol dehydration unit, 9 VAC 5-60-100, Subpart HHH of Virginia air pollution regulations and 40 CFR Part 63, Subpart HHH-National Emission Standards for Hazardous Air Pollutants From Natural Gas Transmission and Storage Facilities apply. The permittee has submitted information in accordance with 40 CFR 63.1274(d)(2) indicating actual average emissions of benzene from the dehydration unit process vents, considering federally enforceable control requirements, are less than 0.9 megagrams per year. Therefore, in accordance with 40 CFR 63.1274(d), the dehydration unit is exempt from the control, monitoring, recordkeeping and reporting requirements specified in §63.1275. The permittee is required, however, to maintain records of actual average benzene emissions determined in accordance with 40 CFR 63.1282(a)(2).

The current Title V operating permit, expiration date September 7, 2006, contains the following condition IV.A.2:

The permittee is exempt from the requirements of 40 CFR 63.1274(c) if the criteria listed in (d)(2) of 40 CFR 63.1274 and (a) below are met.

- (a) The actual average emissions of benzene from the glycol dehydration unit process vents to the atmosphere are less than 0.9 megagram per year as determined by the procedures specified in 40 CFR 63.1282(a)(2) and B.1 below.

There is no limitation or requirement of the permittee in the above condition. Therefore, to make the permit more efficient, the condition has been removed.

The following limitations are State BACT requirements from Conditions 4 and 6 of the minor NSR permit issued on January 23, 2001 (as amended March 28 and May 3, 2006):

Condition 4 requires control of VOC emissions from the Taylor Forge glycol regeneration unit by an air-cooled condenser system. Upon removal of the condenser system, VOC emissions from the glycol regeneration unit shall be controlled by a Tornado Technologies, Inc. natural gas-fired thermal oxidizer, or equivalent.

Condition 6 limits the approved fuel for the Tornado Technologies thermal oxidizer to natural gas.

The permittee will be required to maintain a minimum temperature of 1,500 °F in the thermal oxidizer chamber to ensure effective operation of the oxidizer.

Monitoring

The thermal oxidizer shall be equipped with a device to continuously monitor the temperature in the thermal oxidizer chamber. The temperature monitoring device shall be installed, maintained, calibrated and operated in accordance with the manufacturer's written requirements or recommendations, as a minimum. The temperature monitoring device shall be provided with adequate access for inspection and shall be in operation when the thermal oxidizer is operating.

The temperature in the thermal oxidizer shall be recorded once each hour, at a minimum, when the thermal oxidizer is operating.

Recordkeeping

The permit includes requirements for maintaining records of all monitoring and testing required by the permit.

The permittee will be required to keep hourly records of the thermal oxidizer temperature.

9 VAC 5-60-100, Subpart HHH of Virginia air pollution regulations and the following provisions of 40 CFR Part 63, Subpart HHH-National Emission Standards for Hazardous Air Pollutants from Natural Gas Transmission and Storage Facilities apply to the dehydration unit, S003:

40 CFR 63.1284(d)(2): Maintain records of actual average benzene emissions as determined in accordance with 40 CFR 63.1282(a)(2).

Testing

The permit does not require source tests. A table of test methods has been included in the permit if testing is performed. The Department and EPA have the authority to require testing not included in this permit if necessary to determine compliance with an emission limit or standard.

Reporting

There are no specific reporting requirements applicable to glycol dehydration unit, S003.

EMISSION UNIT APPLICABLE REQUIREMENTS – Storage Tanks T001 and T010

The New Source Performance Standards (NSPS) for volatile organic liquid storage vessels in 40 CFR Part 60 Subpart Kb have been amended to apply to each storage vessel with a capacity greater than or equal to 75 m³. No storage tank at the facility has a capacity greater than 12,000 gallons (45.43 m³). Therefore, NSPS Subpart Kb and the requirements for tanks T001 and T010

in the current Title V permit no longer apply and have been removed from the renewal permit. Prior to the amendment, Subpart Kb applied to each storage vessel with a capacity greater than or equal to 40 m³.

EMISSION UNIT APPLICABLE REQUIREMENTS - Facility-Wide Requirements

Limitations

The following limitations are requirements from Condition 14 of the minor NSR permit issued on January 23, 2001 (as amended March 28 and May 3, 2006):

Condition 14 requires the permittee to take the following measures in order to minimize the duration and frequency of excess emissions, with respect to air pollution control equipment and process equipment which affect such emissions:

- Develop a maintenance schedule;
- Maintain an inventory of spare parts;
- Have available written operating procedures for equipment. These procedures shall be based on the manufacturer's recommendations, at a minimum; and
- Train operators in the proper operation of all such equipment and familiarize the operators with the written operating procedures.

Monitoring and Recordkeeping

The monitoring and recordkeeping requirements in Condition 10 of the NSR permit have been modified to meet Part 70 requirements.

The permittee will maintain records of all scheduled and non-scheduled maintenance.

The permittee will maintain records of the training provided including the names of trainees, the date of training and the nature of the training.

Testing

The permit does not require source tests. A table of test methods has been included in the permit if testing is performed. The Department and EPA have the authority to require testing not included in this permit if necessary to determine compliance with an emission limit or standard.

Reporting

There are no specific facility-wide reporting requirements included in the permit.

GENERAL CONDITIONS

The permit contains general conditions required by 40 CFR Part 70 and 9 VAC 5-80-110, that apply to all Federal operating-permit sources. These include requirements for submitting semi-annual monitoring reports and an annual compliance certification report. The permit also requires

notification of deviations from permit requirements or any excess emissions.

Comments on General Conditions

B. Permit Expiration

This condition refers to the Board taking action on a permit application. The Board is the State Air Pollution Control Board. The authority to take action on permit application(s) has been delegated to the Regions as allowed by §2.1-20.01:2 and §10.1-1185 of the *Code of Virginia*, and the “Department of Environmental Quality Agency Policy Statement No. 3-2001”.

F. Failure/Malfunction Reporting

Section 9 VAC 5-120-180 requires malfunction and excess emissions reporting within four hours of discovery. Section 9 VAC 5-80-250 of the Title V regulations also requires malfunction reporting; however, reporting within two days. Section 9 VAC 5-20-180 is from the general regulations. All affected facilities are subject to 9 VAC 5-20-180 including Title V facilities. Title V facilities are subject to both sections. A facility may make a single report that meets the requirements of 9 VAC 5-20-180 and 9 VAC 5-80-250. The report must be made within four day time business hours after discovery of the malfunction.

U. Malfunction as an Affirmative Defense

The regulations contain two reporting requirements for malfunction that coincide. The reporting requirements are listed in sections 9 VAC 5-80-250 and 9 VAC 5-20-180. The malfunction requirements are listed in General Condition U and General Condition F. For further explanation see the comments on General Condition F.

Y. Asbestos Requirements

The Virginia Department of Labor and Industry under Section 40.1-51.20 of the Code of Virginia also holds authority to enforce 40 CFR 61 Subpart M, National Emission Standards for Asbestos.

STATE-ONLY APPLICABLE REQUIREMENTS

The following Virginia Administrative Codes have specific requirements only enforceable by the State and have been identified as applicable by the applicant:

9 VAC 5 Chapter 60, Part II, Article 5, Emission Standards for Toxic Pollutants from New and Modified Sources.

INAPPLICABLE REQUIREMENTS

New Source Performance Standard (NSPS) requirements for petroleum liquid storage vessels in 40 CFR Part 60 Subpart Ka and 9 VAC 5-50-410 are not applicable. According to application information, the storage capacity of each petroleum liquid storage vessel at the facility is less than the applicable capacity indicated by the standards.

NSPS requirements for volatile organic liquid storage vessels in 40 CFR Part 60 Subpart Kb and 9 VAC 5-50-410 are not applicable. 40 CFR 60.110b(a) indicates that the subpart applies to each vessel with a capacity greater than or equal to 75 m³. Application information indicates there is no tank at the facility with a capacity greater than 12,000 gallons (45.43 m³).

NSPS requirements for stationary gas turbines in 40 CFR Part 60 Subpart GG and 9 VAC 5-50-410 are not applicable. There are no gas turbines at the facility.

The MACT standards for oil and natural gas production facilities in 40 CFR Part 63 Subpart HH and 9 VAC 5-60-100 are not applicable. The facility does not produce oil or natural gas.

The MACT standards for stationary reciprocating internal combustion engines in 40 CFR Part 63 Subpart ZZZZ and 9 VAC 5-60-100 are not applicable. The Cooper Bessemer engines at the facility are spark ignition two stroke lean burn engines. In accordance with 40 CFR 63.6590(b)(3), spark ignition, two stroke lean burn engines do not have to meet the requirements of the subpart, of Subpart A or initial notification requirements.

The MACT standards for industrial, commercial and institutional boilers and process heaters in 40 CFR Part 63 Subpart DDDDD and 9 VAC 5-60-100 are not applicable. The boilers at the facility consist of existing and new small gaseous fuel units as defined in the subpart. In accordance with 40 CFR 63.7506(c), existing and new small gaseous fuel boilers and process heaters are not subject to any requirements in the subpart or Subpart A.

INSIGNIFICANT EMISSION UNITS

The insignificant emission units are presumed to be in compliance with all requirements of the Clean Air Act as may apply. Based on this presumption, no monitoring, recordkeeping or reporting shall be required for these emission units in accordance with 9 VAC 5-80-110.

Insignificant emission units include the following:

Emission Unit No.	Emission Unit Description	Citation ¹ (9 VAC_)	Pollutant Emitted (5-80-720 B.)	Rated Capacity (5-80-720 C.)
S007	Miscellaneous boilers and heaters	5-80-720 A, B and C	NO _x , CO, VOC, SO ₂ and PM-10	0.53 MMBtu/hr
T001	Storage Tank: Pipeline Liquids (H ₂ O)	5-80-720 B	VOC	7,000 gallons

Emission Unit No.	Emission Unit Description	Citation ¹ (9 VAC_)	Pollutant Emitted (5-80-720 B.)	Rated Capacity (5-80-720 C.)
T002	Storage Tank: Pipeline Liquids (H ₂ O)	5-80-720 B	VOC	12,000 gallons
T003	Storage Tank: Oil	5-80-720 B	VOC	7,000 gallons
T004	Storage Tank: Coolant	5-80-720 B	VOC	7,000 gallons
T005	Storage Tank: Oil	5-80-720 B	VOC	3,200 gallons
T006	Storage Tank: Triethylene Glycol	5-80-720 B	VOC	3,000 gallons
T007	Storage Tank: Oil	5-80-720 B	VOC	1,000 gallons
T008	Storage Tank: Coolant	5-80-720 B	VOC	1,000 gallons
T010	Storage Tank: Triethylene Glycol	5-80-720 B	VOC	3,000 gallons
T011	Storage Tank: Pipeline Liquids (BTEX)	5-80-720 B	VOC	12,000 gallons
T013	Storage Tank: Oil	5-80-720 B and C	VOC	90 gallons
T014	Storage Tank: Oil	5-80-720 B and C	VOC	250 gallons
L001	Truck Loading: Pipeline Liquids (H ₂ O)	5-80-720 B	VOC	9,000 gal/hr
L002	Truck Loading: Pipeline Liquids (BTEX)	5-80-720 B	VOC	9,000 gal/hr
L003	Truck Loading: Oil	5-80-720 B	VOC	9,000 gal/hr

Emission Unit No.	Emission Unit Description	Citation ¹ (9 VAC_)	Pollutant Emitted (5-80-720 B.)	Rated Capacity (5-80-720 C.)
L004	Truck Loading: Coolant	5-80-720 B	VOC	8,000 gal/hr
L005	Truck Loading: Triethylene Glycol	5-80-720 B	VOC	6,000 gal/hr
PC01	Piping Components: Natural Gas	5-80-720 B	VOC	N/A
PC02	Piping Components: Pipeline Liquids (BTEX)	5-80-720 B	VOC	N/A
PC03	Piping Components: Oil	5-80-720 B	VOC	N/A
PC04	Piping Components: Coolant	5-80-720 B	VOC	N/A
PC05	Piping Components: Triethylene Glycol		VOC	N/A
PC06	Piping Components: Pipeline Liquids (H ₂ O)	5-80-720 B	VOC	N/A
GR01	Gas Releases: Miscellaneous	5-80-720 A and B	VOC	N/A
PW01	Parts Washer: Remote Reservoir	5-80-720 B	VOC	N/A

¹The citation criteria for insignificant activities are as follows:

9 VAC 5-80-720 A - Listed Insignificant Activity, Not Included in Permit Application

9 VAC 5-80-720 B - Insignificant due to emission levels
9 VAC 5-80-720 C - Insignificant due to size or production rate

CONFIDENTIAL INFORMATION

The permittee did not submit a request for confidentiality. All portions of the Title V application are suitable for public review.

PUBLIC PARTICIPATION

A public notice regarding the draft permit was published in The Dickenson Star newspaper in Clintwood, Virginia on May 31, 2006. A copy of the draft permit and public notice were sent to the EPA by electronic mail on May 25, 2006. A copy of the public notice was sent to the affected states, which include Kentucky, West Virginia and Tennessee by postal mail on May 25, 2006. A copy of the public notice was sent to all persons on the Title V mailing list by electronic mail, postal mail or facsimile no later than May 31, 2006.

Comments were accepted from May 31, 2006, through June 30, 2006. No comments were received from the EPA, the affected states or the public regarding the draft permit.

Attachment A

Hourly Fuel Consumption Based on Maximum Capacity of the Cooper-Bessemer Compressor Engines

Fuel consumption was evaluated in consideration of manufacturer's data and actual stack test data. The highest fuel consumption rate calculated using either of those two sets of data was then assumed to be the fuel consumption rate at maximum capacity of each engine. Understanding that the maximum rated horsepower of 4,650 hp per engine is a nominal rating and the engines could possibly produce more than 4,650 hp during peak operation, 10% of the current horsepower rating is added to account for peak operation. The source has not exceeded a nominal horsepower rating during any previous stack tests by more than 3.125%. Therefore, for the purpose of calculating maximum hourly fuel consumption, the maximum capacity of each engine is assumed to be 5115 hp.

Fuel Consumption Based on Manufacturer's Data

Based on manufacturer's data, the W-330 model engine can consume 6885 BTU/hp-hr. An engine operating at 5115 hp would then be able to operate as follows:

$$(6885 \text{ BTU/hp-hr})(5115 \text{ hp}) = 35,216,775 \text{ BTU/hr.}$$

The average heating value as indicated by data from the 4 previous stack tests is 1037 BTU/cf. The maximum fuel consumption rate of each engine based on manufacturer's data is then calculated as follows:

$$(35,216,775 \text{ BTU/hr})(1 \text{ cf}/1037 \text{ BTU}) = 33,960 \text{ cf/hr.}$$

Fuel Consumption Based on Stack Test Data

Fuel consumption data from stack tests on the engines indicates a maximum fuel consumption rate of 493 cf/min at 4408 hp. A fuel consumption rate per horsepower is calculated as follows:

$$(493 \text{ cf/min})/(4408 \text{ hp}) = 0.11184 \text{ cf/min/hp.}$$

Maximum fuel consumption based on stack test data is then calculated as follows:

$$(0.11184 \text{ cf/min/hp})(5115 \text{ hp})(60 \text{ min/hr}) = 34,324.2 \text{ cf/hr.}$$

The greater fuel consumption rate of 34,324 cf/hr is then assumed to be the fuel consumption rate of each engine at maximum capacity.

Attachment B

Emissions of Nitrogen Oxides, Carbon Monoxide, Volatile Organic Compounds, Particulate Matter (PM) and PM-10 from the Cooper-Bessemer Compressor Engines

The 1992 stack test data will be used as a basis for calculating fuel-based emission factors since the test data indicates higher emission rates than other stack test data. Emission factors for nitrogen oxides (NO_x) and carbon monoxide (CO), in pounds of pollutant per cubic foot of gas burned, will be calculated using average emission rates for those pollutants and average fuel consumption during each of the 3 runs of the stack test. Data from the 1992 stack test that will be used to calculate the emission factors is as follows:

Engine horsepower (average):	4,490 hp,
Fuel Consumption/engine (average):	488 cubic feet/min,
NO _x emissions rate (average):	12.47 lb/hr,
CO emissions rate (average):	7.7 lb/hr,
THC emissions rate (average):	31.03 lb/hr.

The NO_x emission factor is calculated as follows:

$$(12.47 \text{ lb/hr}) / (488 \text{ cf/min})(60 \text{ min/hr}) = 0.00043 \text{ lb/cf.}$$

The CO emission factor is calculated as follows:

$$(7.7 \text{ lb/hr}) / (29,280 \text{ cf/hr}) = 0.00026 \text{ lb/cf.}$$

Emissions are then calculated based on the permitted fuel consumption by each engine of 34,324 cf/hr, and 300,680,000 cf/yr.

NO_x emissions from each engine are calculated as follows:

$$\begin{aligned} (0.00043 \text{ lb/cf})(34,324 \text{ cf/hr}) &= 14.8 \text{ lb/hr,} \\ (0.00043 \text{ lb/cf})(300,680,000 \text{ cf/yr})(1 \text{ ton}/2000 \text{ lb}) &= 64.7 \text{ tons/yr.} \end{aligned}$$

CO emissions from each engine are calculated as follows:

$$\begin{aligned} (0.00026 \text{ lb/cf})(34,324 \text{ cf/hr}) &= 9.0 \text{ lb/hr,} \\ (0.00026 \text{ lb/cf})(300,680,000 \text{ cf/yr})(1 \text{ ton}/2000 \text{ lb}) &= 39.1 \text{ tons/yr.} \end{aligned}$$

There are no stack test data for PM or VOC emissions from the engines; therefore, emission factors from the current version of AP-42 are used. The current AP-42 PM emission factor for 2-

stroke lean burn reciprocating natural gas engines is 3.84×10^{-2} lbs/mmBtu (filterable) + 9.91×10^{-3} lbs/mmBtu (4.831×10^{-2} combined). This equates to:

$$\begin{aligned}(35.22 \text{ mmBtu/hr})(0.04831 \text{ lb/mmBtu}) &= 1.7 \text{ lb/hr} \\ (1.7 \text{ lb/hr})(8760 \text{ hr/yr})/(2000 \text{ lb/ton}) &= 7.4 \text{ tons/yr}\end{aligned}$$

The current AP-42 emission factor of 0.12 lb/mmBtu (Table 3.2-1) is used to calculate VOC emissions from the engines as follows:

$$\begin{aligned}(35.22 \text{ mmBtu/hr})(0.12 \text{ lb/mmBtu}) &= 4.2 \text{ lb/hr} \\ (4.2 \text{ lb/hr})(8760 \text{ hr/yr})/(2000 \text{ lb/ton}) &= 18.4 \text{ tons/yr}\end{aligned}$$